A STATISTICAL STUDY OF THE PREDICTION OF READING ACHIEVEMENT IN THE FIRST GRADE BY THE READING READINESS FACTORS OF VISUAL DISCRIMINATION, AUDITORY DISCRIMINATION, AND IQ

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CHAPTER I

PRESENTATION OF THE PROBLEM

Introduction

Readiness is basic to all learning, whether it is a recognized concept or not. It is the foundation for order and development in school tasks. As far back as 1800, we find an interest in and awareness of readiness. Pestalozzi (Encyclopedia of Educational Research, 1950) wrote: "All instruction of man is then only the art of helping Nature to develop in her own way; and this art rests essentially on the relation and harmony between the impressions received by the child and the exact degree of his developed powers. It is also necessary in the impressions that are brought to the child by instruction that there should be a sequence, so that beginning and progress should keep pace with the beginning and progress of the powers to be developed in the child." Basically, Pestalozzi had made the following observations: (1) that it is important to start teaching a child when he has reached a maturation level appropriate for the task; (2) that instruction is beneficial only when the learning expected is geared to the child's present ability; and (3) that instruction should be developmental or sequential to meet the child's needs and learning progress.

In modern times we are still studying readiness to find answers to learning problems. Hildreth (1950) lists these readiness factors

in learning: mental maturity, perceptual maturity, sensory acuity, linguistic maturity, social and emotional adjustment, and background of experience.

This study of learning readiness is concerned specifically with reading readiness, a state of development at which the child is ready to begin learning to read. Reading readiness involves many factors. Marion Monroe (1938) lists mental age, physiological factors, personality factors, language factors and special skills, interests and information as prime factors in reading readiness. Monroe's physical factors refer to visual and auditory acuity and left to right eye movements. Betts (1946) lists cultural readiness, social adjustment, interests, chronological age, memory span, home background, language facility, hearing, visual discrimination, auditory discrimination, color discrimination, motor control, and neurological status as basic factors in readiness to read. Gray (1962) lists physical readiness (visual and auditory acuity), experiental background, emotional control, social readiness, mental readiness, and language proficiency as prime factors in reading readiness.

There is a general acceptance by many authorities that visual discrimination, auditory discrimination, and intelligence are important factors in learning to read. The need for the child to discriminate letter from letter and word from word visually and audibly is important for saying or identifying the word. Intelligence, on the other hand, is important for understanding the meaning or concept of the printed word or words.

Factors considered in this study include visual discrimination,

auditory discrimination, and intelligence and their effect on achievement or success in the first grade. These elements were chosen because they are measurable and are basic factors in the reading progress. Researchers and teachers use these factors to determine the child's readiness. Further study on the accuracy of prediction on achievement would benefit the researcher, teacher, and child.

Statement of the Problem

The purpose of this study is to evaluate the use of visual discrimination, auditory discrimination and IQ as criteria for predicting readiness to read.

The research hypotheses in this study are as follows:

1. In the first grade there is a significant relationship between intelligence scores, as measured by the California Short-Form Test of Mental Maturity, Pre-Primary, and reading achievement, as measured by Gates Primary Reading Tests, Type PPR.
2. In the first grade there is a significant relationship between auditory discrimination scores, as measured by the Murphy-Durrell Diagnostic Reading Readiness Test, and reading achievement, as measured by Gates Primary Reading Test, Type PPR.
3. In the first grade there is a significant relationship between visual discrimination, as measured by the Murphy-Durrell Diagnostic Reading Readiness Test, and reading achievement, as measured by Gates Primary

Reading Test, Type PPR.

Definitions

Basic terms and concepts important to this study are defined as follows:

Reading Readiness is the physical, mental, social, and emotional maturation necessary for undertaking instruction in reading at a given level of difficulty, in this case, beginning reading.

Visual Discrimination is the ability to distinguish differences among objects, letters, and words.

Auditory Discrimination is the ability to distinguish differences among letter sounds and word sounds.

Reading Achievement (or success) refers to the reading grade placement as measured by the Gates Primary Reading Test, Type PPR.

Intelligence refers to the measurements or scores of the California Short-Form Test of Mental Maturity, Pre-Primary.

CHAPTER II

REVIEW OF THE LITERATURE

There has been much written about readiness and the factors involved in readiness, but there is a limited amount of research on predicting success in first-grade reading by the use of readiness factors. The present review is limited to research involving visual discrimination, auditory discrimination, intelligence, and reading achievement.

Henig (1949) studied the predictive value of a reading readiness test, Lee Clark Readiness Test, and teachers' forecast. With a sample of ninety-eight children, he found that there was "a substantial degree of relationship between reading readiness test results and the degree of ability in reading attained by these children during their first year's experience with a formal reading program." Henig concluded that experienced teachers versed in readiness techniques have judgments of as high predictive value as readiness tests in forecasting reading success.

Sister Mary James Harrington and Donald Durrell (1955) tested five hundred second-grade pupils to determine the correlation of visual discrimination, auditory discrimination, phonics, mental age, and reading achievement. The following correlations were found: visual discrimination and reading .64, phonics and reading

achievement .56, auditory discrimination and reading achievement .54, and mental age and reading achievement .23.

Karlin (1957) studied the predictive value of the Metropolitan Readiness Test in first grade. One hundred eleven first-grade pupils from four elementary schools in Rockville Center, New York, were tested with the Metropolitan Readiness Test on entering first grade and the Gates Reading Achievement Test at the end of first grade. The coefficient of correlation equaled .36 and its standard error .08. The r is thus significant at the .01 level. Karlin thought that the most one can conclude is that the relationship between the reading readiness test scores and the reading achievement test scores is positive, but small.

Donald D. Durrell (1958) studied two thousand children in four communities within a twenty-mile radius of Boston to answer the following questions: (1) What are the differences among beginning first-grade children in different levels of letter knowledge, in ability to identify separate sounds in words? (2) What is the relationship between these abilities and reading success? (3) Does early systematic instruction in letter names and sounds produce higher reading achievement than incidental instruction in them throughout the year? A summary of some of Durrell's major findings and implications follows:

1. Most reading difficulties can be prevented by an instructional program which provides early instruction in letter names and sounds, followed by applied phonics and accompanied by suitable practice in mean-

ingful sight vocabulary and aids to attentive silent reading. Among the 1,500 children measured in June, only eighteen had a sight vocabulary of less than fifty words; this is slightly more than one per cent of the population. Four per cent, or sixty-two children, had a sight vocabulary of less than one hundred words.

2. Early instruction in letter names and sounds produces a higher June reading achievement than does such instruction given incidentally during the year.

3. Children with high learning rates and superior background skills make greater progress when conventional reading readiness materials are omitted from their reading programs.

4. Children entering first grade present wide differences in levels of letter knowledge.

5. Tests of knowledge of letter names at school entrance are the best predictors of February and June reading achievement. They relate most closely to learning rate in September.

6. Chronological age shows little relationship to any of the factors measured at any testing period. It correlates negatively with reading achievement.

7. Mental age, as measured by the Otis Quick-Scoring Tests of Mental Ability, has a low relationship to reading achievement and to letter and word perception skills.

8. There appears to be no basis for the assumption that a sight vocabulary of seventy-five words should be taught before word analysis skills are presented. Of the 1,170 children tested in February, only nine achieved a sight vocabulary of more than seventy words when they knew fewer than twenty letters. Of the children who knew more than twenty letters, 675 had a sight vocabulary of more than seventy words. While a knowledge of letter names and sounds does not assure success in acquiring a sight vocabulary, lack of that knowledge produces failure.

Bremer (1959) tested two thousand children entering first grade with the Metropolitan Readiness Test, and on the completion of first grade, with the Gray-Votaw-Rogers Achievement Test, Primary Test Q. Using the Pearson product-moment correlation, Bremer found a coefficient of .40 between the two test results. This confirms the hypothesis that the Metropolitan Readiness Test is a good predictor of reading achievement in the first grade, significant at the .01 level. But, on further examination, Bremer found the coefficient of alienation about .93 with an index of predicting at .08. He concluded that there is a slight relationship between readiness scores and reading achievement in the first grade, as measured in the study.

Powell and Parsley (1961) studied 863 first-grade pupils to determine the correlation between the Lee-Clark Readiness Test and reading achievement as measured by the California Reading Test. The Lee-Clark Readiness Test was given at the beginning of first

grade, and the California Reading Test at the end of first grade. The correlations were for the reading vocabulary, Lee-Clark Readiness Test and reading achievement .51; for reading comprehension, Lee-Clark Readiness Test and reading achievement .43; and for the entire Lee-Clark Readiness Test and reading achievement .82. It is reported that "The authors feel the Lee-Clark Readiness Test is a useful instrument for predicting the general reading achievement of a total group of first graders."

Summary

None of the studies in the survey of literature attempted to answer or analyze the individual factors of readiness and how they predict success in the first grade except for the study by Donald Durrell (1958) who does give a relationship between chronological age and total reading achievement and between mental age and total reading achievement. He asserted that chronological age and mental age showed little relationship to any reading achievement factors.

Sister Mary Harrington and Donald Durrell (1955) have analyzed the reading factors and achievement of second grade pupils. This study deals with the individual factors of reading readiness, visual discrimination, auditory discrimination, and intelligence as they relate to predicting reading achievement. The highest correlation found is between visual discrimination and reading achievement .64, and the lowest correlation is between mental age and reading achievement .23.

The other studies reported in this chapter deal with the

predictive value of specific readiness tests, which consists mainly of visual acuity and auditory acuity, but these factors are not given separate scores. Henig, Karlin, Bremer, and Power and Parsley found a positive relationship between readiness tests and reading achievement.

CHAPTER III

PERSONNEL AND PROCEDURES

Introduction

This chapter describes the population selected for the study, the tests used to measure reading performance, and the statistical methods used to test the significance of visual discrimination, auditory discrimination, and intelligence as predictors of reading success in the first grade.

Sample

The sample of this study began with 135 pupils from the Presbyterian Church Kindergarten, Methodist Church Kindergarten (morning and afternoon group) and the First Christian Church Kindergarten (morning and afternoon group). Kindergartens participating were those that did not have a formal reading program. These pupils were tested during May, 1961, in their kindergarten classes to evaluate intelligence, visual discrimination, and auditory discrimination.

Due to pupils moving from Stillwater and incomplete test data, the sample dwindled to sixty-six pupils. However, these pupils were tested in May, 1962, in the Stillwater Public Schools to evaluate reading achievement.

The sample was limited to those pupils attending a church kindergarten in Stillwater, to those receiving no formal reading instruction before first grade, and to those attending first grade in Stillwater Public Schools.

Instruments Used in the Study

The Murphy-Durrell Diagnostic Reading Readiness Test (Murphy-Durrell, 1949) was used in this study for the following reasons: (1) it gives a separate score for visual discrimination and auditory discrimination, (2) it has a reliability coefficient of .96 which signifies a high reliability, and (3) it is recognized as a valid and reliable test.

The Auditory subtest is used to determine the ability of pupils to recognize similarities and differences of words by comparing the sound of a word and the name of a picture. There are eighty-four test items; forty-eight of these measure beginning sounds, and thirty-five measure ending sounds of words. These items include initial consonants, final consonants, consonant blends, and rhymes. The validity of this subtest is based on the theory that the ability to hear sounds is important for beginning reading. For a group of 222 first-grade pupils, the reliability (odd-even, corrected) was found to be .96. The norms are based on scores of five thousand first-grade pupils. (Murphy-Durrell, 1949)

The visual subtest is used to determine the accuracy of the pupil's visual perception. There are fifty-two items; twenty-six of these deal with the perception of letters and twenty-six with the

perception of words. The validity of the test is based on the theory that the ability to see differences in the visual forms of words is obviously essential to success in learning to read. For a group of 225 first-grade pupils, the reliability (odd-even, corrected) was .95 (Murphy-Durrell, 1949).

The California Short-Form Test of Mental Maturity, Pre-Primary (1957 Edition) was used in this study for the following reasons: (1) it is a mental maturity test that can be given in a group, (2) it has a reliability coefficient of .93, and (3) it is a standardized test.

The California Short-Form Test of Mental Maturity, Pre-Primary was developed by Elizabeth F. Sullivan (Columbia University), Willis W. Clark (California University), and Ernest Tiegs (Minnesota University). The test has a reliability coefficient of .89 for language, .91 for non-language, with a total coefficient of .93.

The Gates Primary Reading Test, Type PPR (1958 edition) was used in this study for the following reasons: (1) it is a test of reading achievement that can be given in a group, and (2) it is a standardized test.

The Gates Primary Reading Test, Type PPR consists of twenty-six paragraphs accompanied by questions. Vocabulary and sentence structure of the test questions increase gradually in complexity and difficulty, and the successive passages become longer.

The visual and auditory subtests of Murphy-Durrell Diagnostic Reading Readiness Test and the California Short-Form Test of Mental Maturity, Pre-Primary were administered to 135 kindergarten pupils in May, 1961, at the completion of kindergarten.

The Gates Primary Reading Test was administered to sixty-six first-grade pupils remaining in the sample in May, 1962.

Statistical Design

The statistic selected for testing the relationship between visual perception, auditory discrimination, and mental maturity with reading achievement was rank-correlation.

The sample of 135 pupils was tested in May, 1961, but due to some students' moving and incomplete test data, sixty-six pupils remained as the sample.

The rank correlation used in this study is the test described by Hirsch (1957) and Smith (1962). The following formula was used:

$$r_r \qquad 1.00 - \frac{(6\ d^2)}{n(n^2-1)}$$

In the formula, d equals the difference between the two variables.

Rank correlation was used because no assumptions about the shape of the distribution of the dependent variable needs to be made; therefore, the formula can be successfully applied, even if the dependent variable is not normally distributed around the regression line. (Hirsch, 1957)

Summary

This chapter describes the sample selected for the study; the tests used to measure visual discrimination, auditory discrimination, intelligence, and reading achievement; and the statistical methods used to determine the correlation between the readiness factors and achievement.

The sample was made up of Stillwater church school kindergarten children who attended first grade at Stillwater Public Schools in 1961-1962. The final sample was sixty-six children.

The measuring instruments used were the Murphy-Durrell Reading Readiness Test (visual acuity and auditory discrimination subtests), the California Short-Form Test of Mental Maturity, and the Gates Reading Test. These tests were chosen for the following reasons: (1) the tests can easily be given to a group, (2) the tests are standardized, and (3) the tests are widely used by reading specialists and teachers.

The statistic used was the rank correlation as described by Hirsch (1957) and Smith (1962). The scores of visual acuity, auditory acuity and IQ were correlated with reading achievement.

CHAPTER IV

TREATMENT OF DATA AND ANALYSIS OF RESULTS

Introduction

This chapter is an account of the statistical treatment of the data and the analysis of the results. This chapter will indicate the degree to which the hypotheses are found to be tenable.

The data will be discussed under the following headings:

Relationship between Auditory Discrimination and Reading Achievement

Relationship between Visual Discrimination and Reading Achievement

Relationship between IQ and Reading Achievement

Relationship between Auditory Discrimination and Reading Achievement

The mean, standard deviation, and rank correlation for auditory discrimination scores taken before the children entered first grade and reading achievement taken at the end of first grade are presented in Table I.

TABLE I

STATISTICAL RELATIONSHIP BETWEEN AUDITORY DISCRIMINATION AND READING ACHIEVEMENT

	May 1961 Auditory Discrimination		May 1962 Reading Achievement
Mean	39.3939		92.7898
Mean Difference		53.3959	
Standard Deviation	33.23		8.062
r^2		.078*	

*With 64 df, not significant at .05 level of confidence.

An r value of .240 is required for .05 significance with 64 degrees of freedom and a two-tailed test. The research hypothesis must be infirmed on the basis of this evidence.

Relationship between Visual Discrimination and Reading Achievement

The mean, standard deviation, and rank correlation for visual discrimination scores taken before the children entered first grade and reading achievement taken at the end of first grade are presented in Table II.

TABLE II

STATISTICAL RELATIONSHIP BETWEEN VISUAL DISCRIMINATION AND READING ACHIEVEMENT

	May 1961 Visual Discrimination		May 1962 Reading Achievement
Mean	52.59		92.7898
Mean Difference		40.1998	
Standard Deviation	23.45		8.062
r^2		.2833*	

*With 64 df, significant at .05 level of confidence.

An r value of .024 is required for .05 significance with 64 degrees of freedom and a two-tailed test. The null hypothesis can be rejected and the research hypothesis confirmed on the basis of this evidence.

Relationship between Intelligence and Reading Achievement

The mean, standard deviation, and rank correlation for IQ scores taken before the children entered first grade and reading achievement taken at the end of first grade are presented in Table III.

TABLE III

STATISTICAL RELATIONSHIP BETWEEN IQ AND READING ACHIEVEMENT

	May 1961 IQ		May 1962 Reading Achievement
Mean	110.106		92.7898
Mean Difference		17.317	
Standard Deviation	7.27		8.062
r^2		.17*	

*With 64 df, not significant at .05 level of confidence.

An r value of .240 is required for .05 significance with 64 degrees of freedom and a two-tailed test. The research hypothesis must be infirmed on the basis of this evidence.

A comparison of means, standard deviations, and rank correlations for auditory acuity, visual acuity, IQ, and reading achievement is presented in Table IV.

TABLE IV

COMPARISON OF MEANS, STANDARD DEVIATIONS, AND RANK CORRELATIONS

Tests	Means	Standard Deviations	Correlations
Auditory	39.3939	33.23	.078
Visual	52.59	23.45	.2833
IQ	110.106	7.27	.17
Reading	92.7898	8.062	

Summary

This chapter has presented the statistical treatment of the data. The following hypotheses were infirmed:

1. In the first grade there is a significant relationship between intelligence scores, as measured by the California Short-Form Test of Mental Maturity, and reading achievement, as measured by Gates Primary Reading Tests.
2. In the first grade there is a significant relationship between auditory discrimination scores, as measured by Murphy-Durrell Diagnostic Reading Readiness Test, and reading achievement, as measured by Gates Primary Reading Tests.

The following hypothesis was confirmed:

1. In the first grade, there is a significant relationship between visual discrimination, as measured by Murphy-Durrell Diagnostic Reading Readiness Test, and reading achievement, as measured by the Gates Primary Reading Tests.

CHAPTER V

SUMMARY AND CONCLUSIONS

General Summary of the Investigations

This investigation examined the predictive value of three reading readiness factors in predicting reading achievement in the first grade. These factors are the following:

(1) The value of auditory discrimination scores in predicting reading achievement in the first grade

(2) The value of visual discrimination scores in predicting reading achievement in the first grade

(3) The value of IQ scores in predicting reading achievement in the first grade.

All pupils who attended a Stillwater church kindergarten in the spring of 1961, and Stillwater Public Schools, first grade 1961-1962, were used for the investigation. The group consisted of sixty-six pupils.

One hundred thirty-five pupils from the Presbyterian Church Kindergarten, Methodist Church Kindergarten, and the First Christian Church Kindergarten were tested at the end of the 1960-1961 kindergarten term in May, 1961, to determine their skill in visual discrim-

ination, auditory discrimination and intelligence.

Sixty-six of these pupils enrolled in the Stillwater schools for first grade. These pupils were tested at the completion of first grade, May, 1962.

The testing instruments used were the California Short-Form Test of Mental Maturity, Pre-Primary, the Murphy-Durrell Diagnostic Reading Readiness Test, and the Gates Primary Reading Test, Type PPR. All tests used are standardized tests and yield a high reliability coefficient.

The data were treated statistically by rank correlation for prediction and the mean and standard deviation for describing the sample.

Summary of Results

The results indicate that visual discrimination is a significant predictor of reading success in first grade. The r value of .2833 is significant at the .05 level of confidence.

The results also indicate that intelligence and auditory discrimination are not significant predictors of reading success in the first grade. The r value of .078 for auditory discrimination is not significant at the .05 level of confidence. The r value of .17 for intelligence is not significant at the .05 level of confidence.

Concluding Statement

This study indicates that the ability to discriminate between letters and words visually is more important in predicting success in beginning reading than intelligence or auditory discrimination. However, because the students used in the sample happen to be high

achievers on tasks, this statement can only reflect the average to good readers. Further studies with poor or remedial children need to be made in order to see the important factor in their cases.

Visual discrimination proved to be a better predictor of reading achievement at the first grade level. Reasons for this, of course, are not revealed by this study. Causes might be examined by further studies attempting to determine the following:

(1) Whether in most children, visual discrimination develops earlier than auditory discrimination

(2) Whether heavy emphasis on visual skills in beginning reading programs causes visual discrimination to develop prior to auditory skills

(3) Whether auditory factors would possibly be better predictions for success in programs emphasizing auditory discrimination prior to visual discrimination

The results of this report do not mean that visual discrimination should be emphasized in the first grade, but that visual discrimination has predictive value as well as learning value. Visual discrimination can assist teachers in assessing the child's ability so she can decide whether a child is ready to begin formal reading.

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Thesis: A STATISTICAL STUDY OF THE PREDICTION OF READING ACHIEVEMENT IN THE FIRST GRADE BY THE READING READINESS FACTORS OF VISUAL DISCRIMINATION, AUDITORY DISCRIMINATION, AND IQ

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